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Growth and Yield Response of Three Mungbean (*Vigna radiata* L.) Cultivars to Varying Seeding Rates

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ABSTRACT

Response of three mungbean cultivars namely NM-92, NARC-Mung-1 and NM-98 to three seeding rates viz. 15, 20 and 25 kg ha^{-1} was studied during the year 2002-2003. Cultivar NM-98 produced maximum number of pods per plant (17.30), grain yield (983.75 kg ha^{-1}) and harvest index value (24.91%). Cultivar NM-92 showed significantly the highest seed protein contents (24.64%). Seed rate of 15 kg ha^{-1} produced maximum pods per plant (18.47) but the lowest grain yield of 908.63 kg ha^{-1}. Seed rate of 25 kg ha^{-1} seemed optimum with grain yield of 1004.36 kg ha^{-1} and could be due to the most optimum plant population in the existing environment.

Key Words: *Vigna radiata* L; Seed rate; Cultivars; Seed yield; Mungbean

INTRODUCTION

Mungbean (*Vigna radiata*. L) commonly known as green gram is one of the important pulse crops of Pakistan . The crop grows best on good loam soil at 24-33^{0}C temperature, but it is also able to survive in alkaline and saline conditions, as it does have some degree of salt resistance. However, waterlogged soils are not fit for its growth (Yadav *et al.*, 1998). The average mungbean yield of Pakistan is 475 kg ha^{-1} (Anonymous, 2001–02), which is for below its potential yield of 1971 kg ha^{-1} reported by Sadiq *et al.* (1999) in promising cultivars. Among crop management practices seeding densities or plant population greatly affect crop growth and then finally grain yield. Therefore seeding density is a key factor in assessing the flexibility and yielding ability of cultivars. Both over and substandard plant population is the major cause of low yield. Jan *et al.* (2000) observed increase in the seed yield with increasing seed rate up to 20 kg ha^{-1}. Significantly maximum seed yield of (861.70 kg ha^{-1}) from seeding rate of 25 kg ha^{-1} had been reported by Ali *et al.* (1999). Panwar and Sirobi (1987) observed increase in seed yield with increasing plant population from 150,000 to 300,000 plants ha^{-1}, but number of pods $plant^{-1}$ and yield per plant decreased in all the four cultivars tested. Present studies were carried out to look into the production potential and growth behaviour of three mungbean cultivars to varying seeding rates under the prevailing environmental conditions of Faisalabad, with aim to determine optimum seed rate and select the best cultivars.

MATERIALS AND METHODS

The experiment was carried out at the Agronomic research area, University of Agriculture, Faisalabad during summer 2002–2003. The experiment was laid out in RCBD with split plot arrangement and was replicated three times. Mungbean cultivars were randomized in main plots and the seed rates in sub plots. The net plot size measured 2.4m × 7.0m. The cultivars used were NM-92, NARC-Mung-1 and NM-98 having a seed rate of 15, 20 and 25 kg ha^{-1}. The crop was sown manually on a well prepared seed bed on a sandy clay loam soil in 30 cm spaced rows with the help of single row hand drill on 13th July, 2002. Whole of NP @ 25:50 kg ha^{-1} were side drilled as basal dose along with seeded rows after sowing. All other agronomic practices were kept normal and uniform in all treatments. Observations like number of plants per plot at harvest, number of pods per plant, number of grains per pod, 1000-grain weight, grain yield, harvest index and grain protein concentration (Jackson, 1960) were recorded. Data so collected were analyzed statistically using Fisher's analysis of variance techniques and Least Significant Difference (LSD) test at 5% probability level was employed to test the significance among treatment's means (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

Significant differences were observed among the cultivars for plant population at harvest. Cultivar NARC-Mung-1 had maximum number of plants per plot (298), while NM-92 had minimum (262). Significant differences in plant population among various cultivars had also been reported by Singh *et al.* (1998). Plant population varied significantly by increasing seeding densities. Seed rate of 25 kg ha^{-1} gave significantly the maximum plant population per plot (313) against the minimum (238) for 15 kg seed ha^{-1}. This was because plant population increased with increase in the seed rate. Singh *et al.* (1991) also reported increase in plant population with increasing seed rate.

The number of pods per plant did not differ significantly among various mungbean cultivars under study

but increase in the seeding density had significant effect on pods per plant. The use of 15 kg seeding rate ha^{-1} produced maximum number of pods per plant (18.47) against the minimum (14.72) with 25 kg seed ha^{-1}, probably due to vigorous plant growth. Similar results were also reported by Panwar and Sirobi (1987).

Mean values for number of grains per pod regarding cultivars and varying seeding densities showed non-significant differences. However, number of grains pod^{-1} varied from 8.96 to 8.97 and 8.92 to 9.00 for mungbean genotypes and seeding rates, respectively. These results are in agreement with those of Hassan (1997).

Cultivar NM-92 exhibited significantly the highest 1000-grain weight (44.06 g) as against 38.30 g for NARC-Mung-1 (Table I). These results are in line with those reported by Kim *et al.* (1998) who reported different test weight among various cultivars. Non-significant differences were observed in 1000-seed weight for varying seeding rates, however, the maximum 1000-grain weight of 42.04 g was recorded when 25 kg ha^{-1} seed rate was used. This increase in 1000-grain weight with increasing seeding densities was due to the reason of negative correlation of this character with number of pods per plant and number of grains per pod. More the number of pods per plant or number of grains per pod less will be 1000-grain weight and vice versa. Non-significant influence on 1000-grain weight under varying seeding densities was also reported by Aziz *et al.* (1988) and Ali *et al.* (1999).

Cultivar NM-98 produced the highest grain yield (983.75 kg ha^{-1}) which was at par with NM-92 (972.23 kg ha^{-1}). On the other hand the lowest grain yield of 933.89 kg ha^{-1} was recorded in case of NARC-Mung-1. Almost similar results were also reported by Jaiswal (1995) who also observed different grain yield among various cultivars. Seed rate of 25 kg ha^{-1} produced significantly the highest grain yield of 1004.36 kg ha^{-1} due to optimum plant population. These findings are in line with Singh *et al.* (1998).

Cultivar NM-98 showed significantly higher value of harvest index (24.91%), which was statistically equal to cultivar NM-92 (24.81%). The lowest harvest index value of 21.72% was observed in case of NARC-Mung-1. These findings are in agreement with those reported by Irshad *et al.* (2000), who reported significant variations for harvest index value among various cultivars. Significantly the highest harvest index value of 25.95% was recorded in plots seeded at 15 kg seed ha^{-1}, while higher seed rate of 25 kg ha^{-1} exhibited minimum harvest index value (21.30%). This is due to the fact that in case of low seeding density grain yield to biological yield ratio was more. Similar results were also reported by Jan *et al.* (2000).

Data pertaining to the protein concentration in Table I revealed that the grain protein contents were influenced significantly by varying seeding rates and cultivars. The highest protein contents (24.64%) were recorded for NM-92 against the lowest (23.94%) for NM-98. This discrepancy for protein concentration among cultivars happened due to differences in their efficiencies to convert nitrogen into amino acids and then into proteins, which is a genetic character. As regarded the seeding densities the highest protein contents (24.63%) were recorded for 15 kg seed ha^{-1} against the lowest (24.05%) for 25 kg ha^{-1}. This is due to the reason that less plant population availed more available sunlight and aeration as well as more space and nutrients in the root zone. Due to more available space in the root zone more nodules per plant were formed and hence more nitrogen fixation resulted in more protein concentration in the sink. These results are in line with Taleei *et al*. (1999) and Dwangan *et al*. (1992).

CONCLUSION

The mungbean cultivars NM-92, NARC-Mung-1 and NM-98 should be sown at 25 kg seed ha^{-1}. Both NM-92 and NM-98 have equal potential but more than NARC-Mung-1 under ecological conditions of Faisalabad.

REFERENCES

Ali, A., A. Malik, M.A. Chaudhry, M.A. Siddique and M. Rafique, 1999. Growth and yield response of mungbean (*Vigna radiata* L.) to different seed rates and levels of phosphorus. *Pakistan J. Biol. Sci*., 2: 879–80

Table I. Yield and yield components of three mungbean cultivars (Vigna radiata L.) as affected by varying seeding rates

	Plants plot^{-1}	Pods plant^{-1}	Grains pod^{-1}	1000-grain weight (g)	Grain yield (kg ha^{-1})	Harvest index (%)	Grain Protein Concent-ration (%)
A. Cultivars							
NM-92	262 b	16.42	8.97	44.06 a	972.23 a	24.81 a	24.64 a
NARC -Mung-1	298 a	16.21	8.96	38.30 c	933.89 b	21.72 b	24.61 a
NM-98	271 b	17.30 ^{NS}	8.97^{NS}	41.67 b	983.75 a	24.91 a	23.94 b
LSD	15.13	2.16	0.30	0.024	34.58	1.62	0.35
B. Seed rates							
15 kg ha^{-1}	238 c	18.47 a	8.98	40.66	908.63 c	25.95 a	24.63 a
20 kg ha^{-1}	279 b	16.73 b	8.92	41.33	976.88 b	24.19 b	24.56 a
25 kg ha^{-1}	313 a	14.72 c	9.00 ^{NS}	42.04 ^{NS}	1004.36a	21.30 c	24.05 b
SD	6.26	0.94	0.08	1.17	12.50	0.79	0.13

Any tow means not sharing a letter differ significantly at 5% probability level (LSD Test)

Anonymous, 2001. Economic Survey 2001–02. *Government of Pakistan Finance Division, Economic Advisor's Wing*, Islamabad. pp: 17–8

Aziz, A., K. Aslam and M. Salim, 1988. Chickpea seed yield as influenced by seeding densities. *Pakistan J. Agric. Res*., 9: 346–8

Dwangan, M.M., N. Pandey, and R.S. Tripathi, 1992. Effect of spacing, irrigation and phosphorous on NP concentration and protein yield of summer green gram. *Ann. Agric. Res*., 13: 280–1

Hassan, R., 1997. Growth and yield response of mungbean (*Vigna radiata* L) to different seed rates and levels of phosphorus. *M.Sc. Thesis*, Department Agron., University of Agriculture, Faisalabad–Pakistan

Irshad, M.N., B.N. Siddiqui and M.Z.Y. Hassan, 2000. Effect of different planting densities on yield and yield components of mungbean (*Vigna radiata* L.). *Pakistan J. Biol. Sci*., 3: 2039–40

Jackson, M.L., 1960. *Soil Chemical Analysis*. pp: 183–92 Constable and Co. Ltd. London

Jaiswal, V.P., 1995. Performance of green gram (*Phaseolus radiatus*) and Black gram (*P. mungo*) genotypes to dates of planting during summer. *Indian J. Agron*., 40: 516–8

Jan, A., S.A. Kaleem, F.H. Taj and H. Khan, 2000. Response of mungbean cultivars to different seeding densities at dry land conditions. *Pakistan J. Biol. Sci*., 3: 2030–2

Kim, S.D., Y.H. Lee, H.S. Kim, S.Y. Lee, J.K. Moon, E.H. Hong and Y.S. Kim, 1998. A dull small seed and high yielding mungbean variety "Kyeongseonnogdu". *RDA J. Crop Sci. II*, 40: 117–20

Panwar, J.D.S. and G.S. Sirobi, 1987. Studies on effect of plant population on grain yield and its components in mungbean (*Vigna radiata* L.). *Indian J. Plant Physiol.*, 30: 412–4

Sadiq, M.S., G. Sarwar and G.S.S. Khattak, 1999. NIAB Mung–98: A diverse, high yielding and disease resistant mungbean variety. *Pakistan J. Biol. Sci*., 2: 455–8

Singh, D., J.P. Sahu and D. Singh, 1998. Performance of mungbean genotypes under different seed rates during spring. *Indian J. Pulses Res*., 11: 144–5

Singh, K.N., A.S. Bali, M.H. Shah and B.A. Khanday, 1991. Effect of spacing and seed rate on yield of green gram (*Phaseolus radiatus*) in Kashmir valley. *Indian J. Agric. Sci*., 61: 326–7

Steel, R.G.D. and J.H. Torrie, 1984. *Principles and Procedures of Statistics. A Biometrical Approach*. pp: 172–7. 2nd ed. McGraw Hill Book Int. Co., Singapore

Taleei, A.R., N. Khoda–Bandeh and B. Gholamie, 1999. Effects of sowing date on grain yield, yield components and percentage of protein in green gram cultivars. *Iranian J. Agric. Sci*., 29: 751–8

Yadav, R.S., R.B. Khare and A.K. Pandey, 1998. Response of water logging on carbohydrate accumulation and seed yield of mungbean *(Vigna radiata* (L.) Wilczek). *Agric. Sci. Digest Karnal*, 18: 157–60

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